

MSFC Electrostatic Levitator (ESL) Rapid Quench System

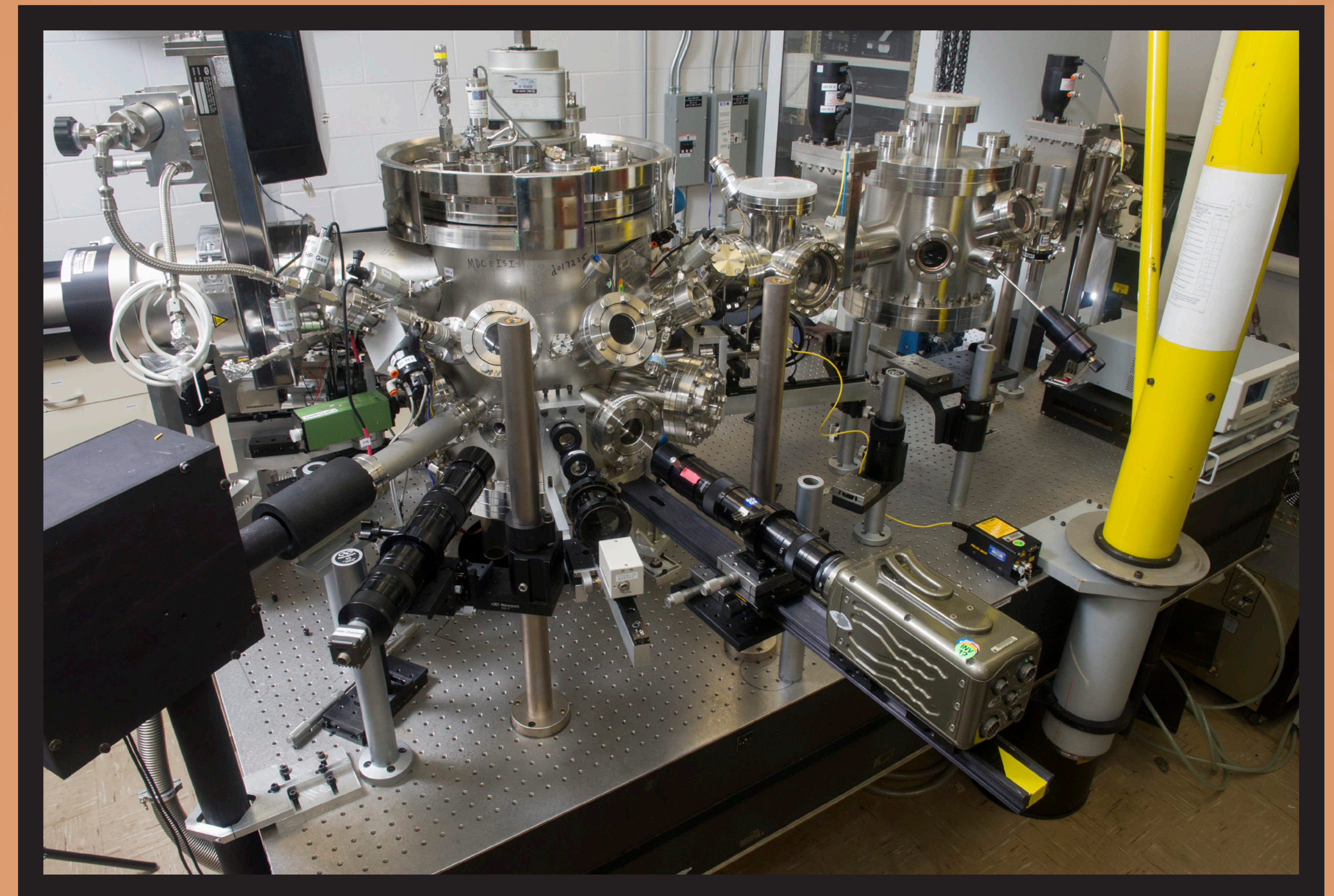
Michael P. SanSoucie, Paul D. Craven, and Jan R. Rogers

The NASA Marshall Space Flight Center (MSFC) Electrostatic Levitator (ESL) Laboratory is a unique facility for investigators studying high-temperature materials. The laboratory boasts two levitators in which samples can be levitated, heated, melted, undercooled, and resolidified, all without the interference of a container or data-gathering instrument.

The ESL main chamber has been upgraded with the addition of a rapid quench system. This system allows samples to be dropped into a quench vessel that can be filled with a low melting point material, such as a gallium or indium alloy. Thereby allowing rapid quenching of undercooled liquid metals.

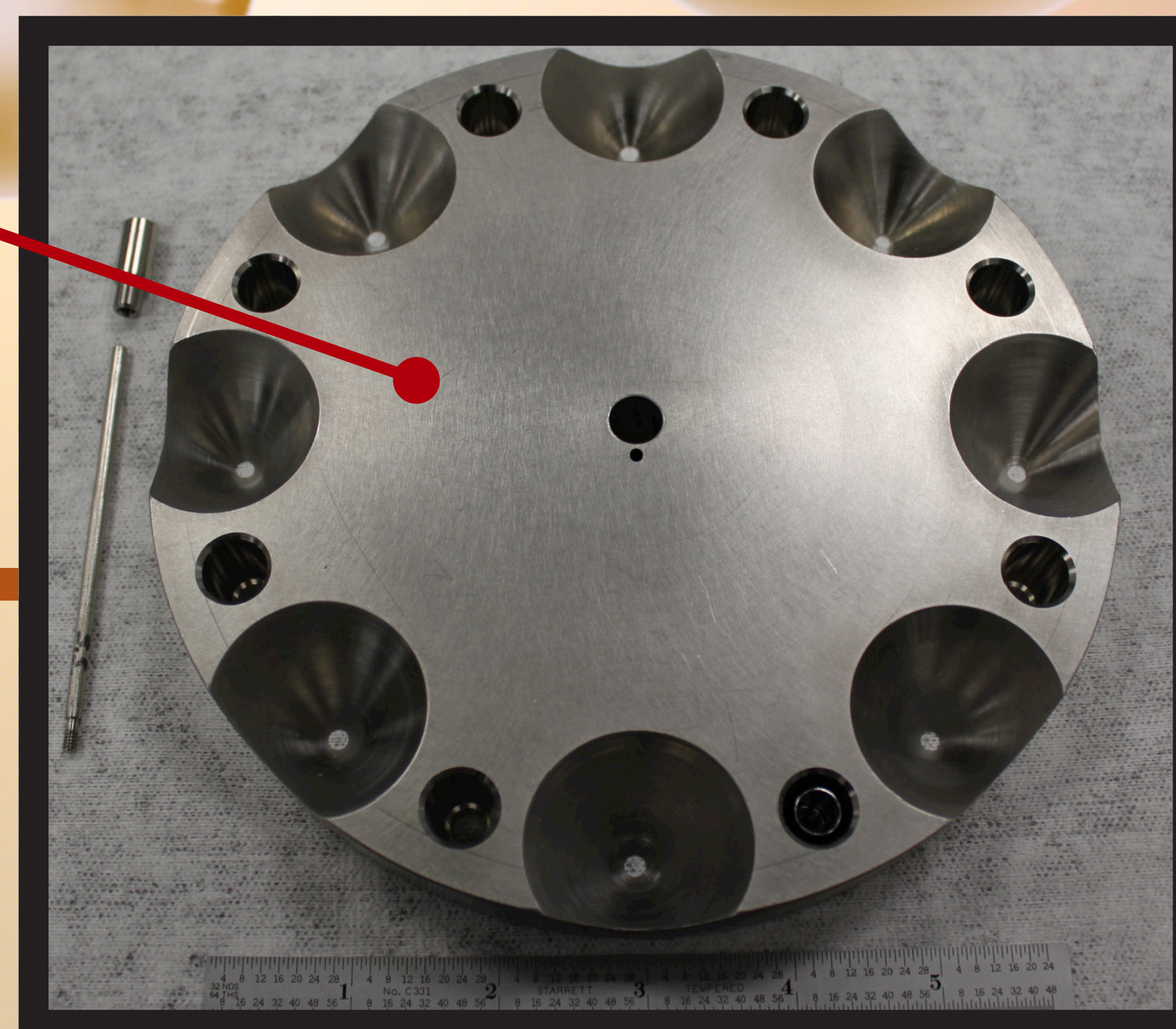
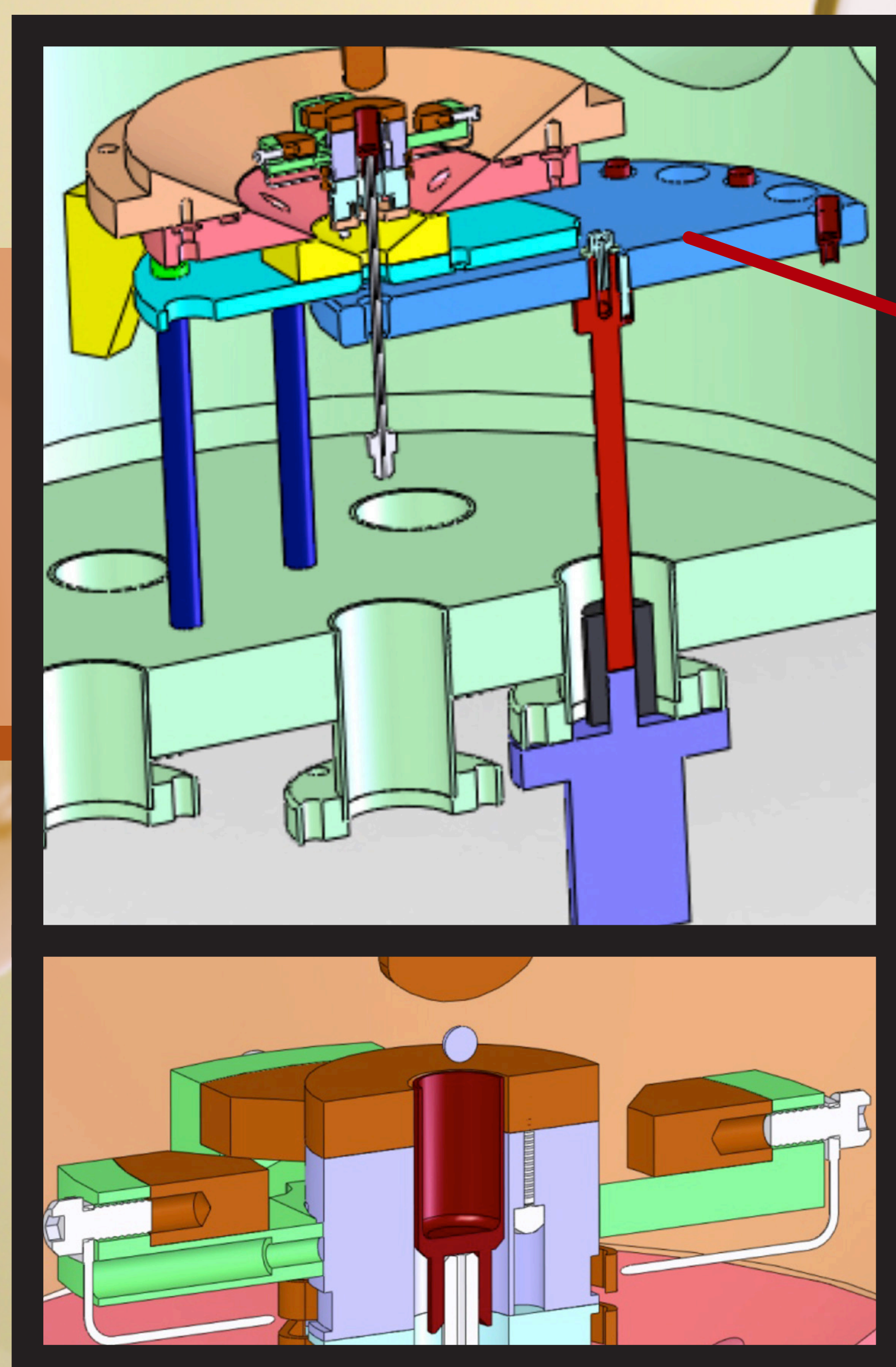
Up to 8 quench vessels can be loaded into the quench wheel, which is indexed with LabVIEW control software. This allows up to 8 samples to be rapidly quenched before having to open the chamber.

The system has been tested successfully on several zirconium samples. Future work will be done with other materials using different quench mediums. Microstructural analysis will also be done on successfully quench samples.

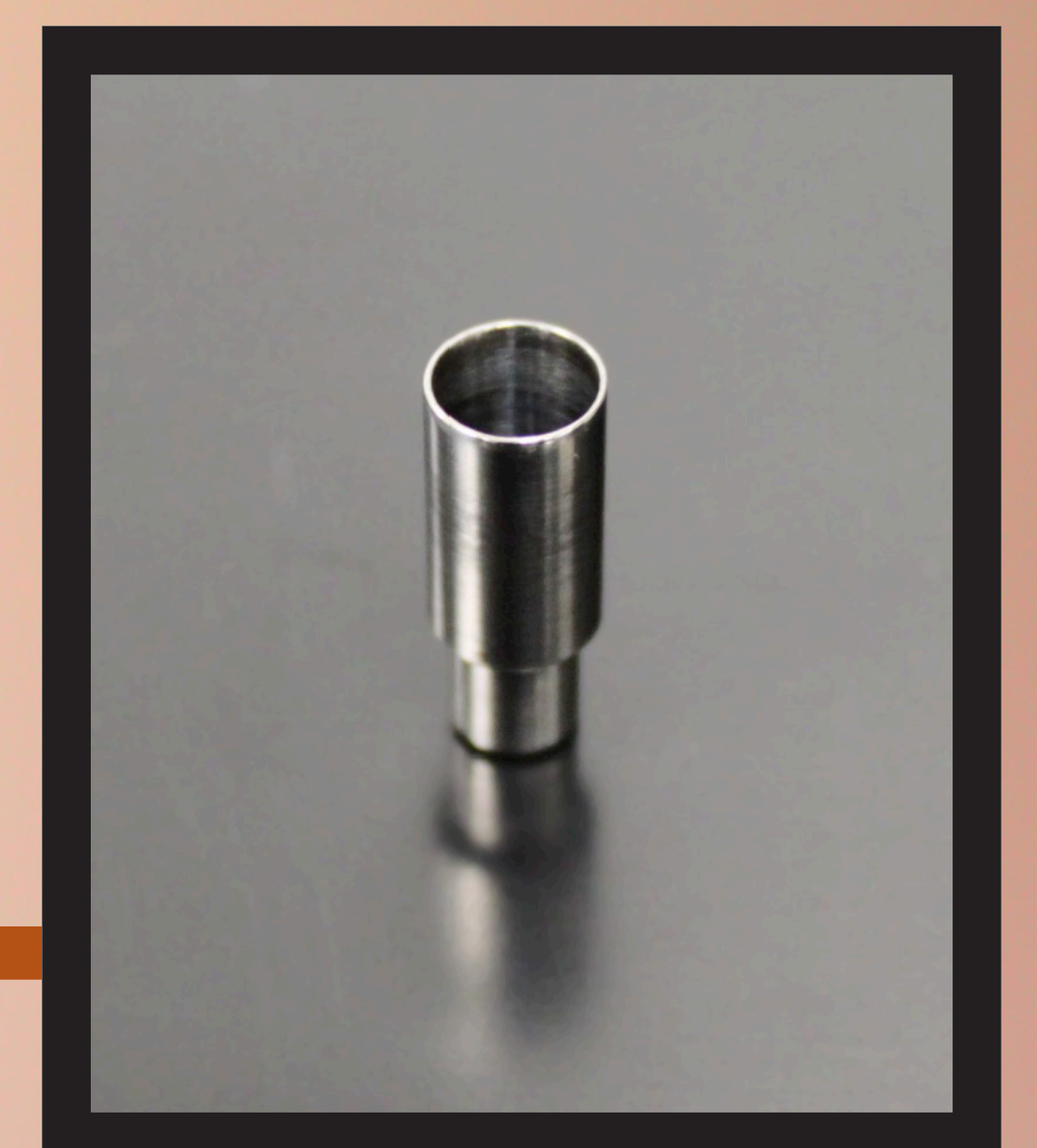


NASA Marshall Space Flight Center (MSFC) Electrostatic Levitator (ESL) main chamber

CAD drawing showing a cross section of the ESL, and a close-up of a levitated sample above a quench vessel



Quench wheel, sample stem, and quench vessel.



Close-up of quench vessel